



Piezoceramic multilayer actuator with a transition  
region between the active region and the inactive  
head and foot regions

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5 The invention concerns a piezoceramic multilayer actuator  
according to the preamble of the first claim.

Multilayer actuators made from piezoceramic materials have  
two-way contacting, that is to say the internal electrodes  
are led out alternately at the surface of the opposite sides  
of the actuator and each is electrically connected to  
10 parallel at that point through an external electrode. For  
electrical isolation, the head region and the foot region  
consist of inactive, that is to say electrode free layers of  
piezoceramic.

15 The shrinkage of the piezoceramic material, in particular in  
the passive head and foot regions, is influenced by the  
sintering process due to the arrangement of the metallic  
electrodes and the layers of piezoceramic material.

Differences in shrinkage between regions located close to  
electrodes and regions located away from electrodes lead to  
20 stresses in the ceramic material, which either cause cracks  
during the sintering process or act to reduce the strength  
of the finished component. As a result, the susceptibility  
of these components to the formation of cracks during  
operation is considerably increased. Different expansion  
25 characteristics of the active and of the passive region  
during operation lead to stresses which favour crack  
formation, in particular at the boundary between the two  
regions. Cracks can be tolerated in a few applications.  
However, there are fundamental problems. If the actuator is  
30 not completely encapsulated, electric fields occur at the  
ends of the electrodes exposed by the cracks, which can lead  
to the adsorption of water or other polar

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